



# Understanding Geography Learning Achievement: The Role of Parental Attention and Physical Learning Environment among High School Students

Claire Chambers<sup>1</sup>, Antonia Ria Issaura<sup>2</sup>, Mousumi Boral<sup>3</sup>, Aeshah Mujahid<sup>4</sup>, Ghufuran Jafar Ismail<sup>5</sup>

<sup>1</sup>School of Geography, University of Nottingham, United Kingdom

<sup>2</sup>Department of Geography Education, Universitas Negeri Yogyakarta, Daerah Istimewa Yogyakarta, Indonesia

<sup>3</sup>Department Geography, Satyapriya Roy College of Education, India

<sup>4</sup>Department of Geography, University of Zawia, Libya

<sup>5</sup>Department of Geography, University of Baghdad, Iraq

## Article Info

### Article history:

Received Mar 27, 2026

Revised Apr 30, 2026

Accepted May 29, 2026

Online First May 31, 2026

### Keywords:

Geography Education  
Learning Environment  
Parental Involvement  
Secondary Education  
Student Achievement

## ABSTRACT

**Purpose of the study:** This study aims to examine the relationships between parental attention, the physical learning environment, and Geography learning achievement among high school students. It also aims to determine the combined contribution of parental attention and the physical learning environment to students' Geography learning achievement.

**Methodology:** Quantitative correlational research design; survey method; structured questionnaire; documentation of Geography achievement scores; proportional random sampling; 105 high school students as respondents; Likert-scale instrument; Kolmogorov–Smirnov normality test; linearity test; multicollinearity test; Pearson product-moment correlation; multiple linear regression; SPSS statistical software.

**Main Findings:** Parental attention was positively associated with Geography learning achievement ( $r = 0.425, p < 0.001$ ). The physical learning environment was positively associated with Geography learning achievement ( $r = 0.466, p < 0.001$ ). Together, parental attention and the physical learning environment significantly predicted Geography learning achievement ( $R = 0.574, R^2 = 0.330, p < 0.001$ ). Parental attention contributed more strongly than the physical learning environment.

**Novelty/Originality of this study:** This study integrates parental attention and the physical learning environment within a Geography education framework and evaluates their individual and combined contributions to learning achievement. Unlike previous studies that focused on general academic performance, this research specifically examines Geography learning achievement, providing empirical evidence on how family support and home learning conditions jointly influence student outcomes.

This is an open access article under the [CC BY](https://creativecommons.org/licenses/by/4.0/) license



### Corresponding Author:

Claire Chambers,

School of Geography, University of Nottingham, University Park, Nottingham NG7 2RD, United Kingdom

Email: [cireechbeerss@gmail.com](mailto:cireechbeerss@gmail.com)

## 1. INTRODUCTION

Geography learning achievement is an important indicator of students' understanding of spatial phenomena, environmental issues, and regional interactions [1], [2]. In high school, geography education is expected to develop analytical thinking, spatial reasoning, and environmental awareness that are relevant to contemporary societal challenges [3], [4]. However, differences in learning achievement among students remain substantial across schools and regions. These differences are often associated not only with cognitive ability but

also with environmental and social factors that support learning. Therefore, identifying external factors that contribute to geography learning achievement is essential for improving educational quality [5], [6].

One factor frequently associated with academic achievement is parental attention. Parental attention includes supervision of learning activities, encouragement, communication about school, and the provision of emotional support [5], [7]. Students who receive consistent parental attention tend to demonstrate better learning discipline and motivation [8], [9]. Several educational studies have shown that parental involvement contributes positively to students' academic performance across subjects [10], [11]. In the context of geography education, parental attention may help students manage study habits and maintain engagement with learning tasks [12], [13].

Another important factor is the physical learning environment. The physical learning environment includes the availability of a quiet study space, adequate lighting, proper ventilation, learning facilities, and minimal distractions [14], [15]. A conducive physical environment can improve concentration, comfort, and persistence during study activities [16], [17]. Conversely, inadequate learning spaces may reduce students' ability to focus and complete academic tasks effectively [18], [19]. Because many learning activities occur at home, the quality of the home learning environment deserves attention as a determinant of academic achievement.

Recent studies have consistently highlighted the importance of family-related factors in shaping students' academic outcomes. Azhari et al. [20] reported that family support significantly contributes to students' learning engagement and motivation, which subsequently influence academic achievement. Similarly, Wang et al. [21] found that parental involvement plays an important role in fostering students' participation and achievement within the learning ecosystem. Furthermore, Yu et al. [22] demonstrated that interpersonal relationships, including parent–student relationships, are associated with students' academic performance. Nevertheless, these studies primarily focused on general academic achievement and did not specifically investigate Geography learning achievement.

The role of learning environments has also received considerable attention in educational research. Wang et al. [21] showed that supportive home learning conditions and access to learning resources positively affect students' engagement and academic outcomes. In addition, Azhari et al. [23] revealed that family support contributes to the development of effective learning habits and improved academic performance. Despite these findings, previous studies have generally examined parental support and learning environments as separate factors. Moreover, limited research has investigated the combined influence of parental attention and the physical learning environment on Geography learning achievement among high school students. Therefore, a significant gap remains in understanding how these external factors jointly contribute to students' achievement in Geography.

The novelty of this study lies in its integrated examination of parental attention and the physical learning environment as predictors of Geography learning achievement among high school students. Previous studies have predominantly focused on general academic or have investigated family-related and environmental factors separately. In contrast, this study specifically addresses Geography learning achievement, a subject area that has received relatively limited attention in relation to home-based educational factors. Furthermore, by simultaneously analyzing parental attention and the physical learning environment, this research provides a more comprehensive understanding of how family and environmental dimensions jointly contribute to students' Geography achievement [24], [25]. The findings are expected to enrich the literature on geography education and provide empirical evidence for designing strategies that enhance students' learning outcomes through both parental engagement and supportive study environments.

Understanding the factors that influence Geography learning achievement has become increasingly important as students are expected to develop spatial thinking, environmental awareness, and problem-solving skills to address contemporary geographical challenges. While previous studies have demonstrated the positive effects of family support and home learning conditions on students' general academic achievement, evidence regarding their influence on Geography achievement remains limited [26], [27]. This lack of subject-specific evidence restricts the ability of educators and policymakers to develop targeted interventions that support Geography learning. Moreover, high school students spend a substantial portion of their learning time outside the classroom, making parental attention and the physical learning environment potentially important determinants of academic success. Therefore, investigating the relationship between these factors and Geography learning achievement is essential for strengthening educational support systems both at home and at school.

Based on the identified research gap, urgency, and novelty, this study aims to determine: (1) the relationship between parental attention and students' Geography learning achievement, (2) the relationship between the physical learning environment and Geography learning achievement, and (3) the relationship between parental attention and the physical learning environment simultaneously with Geography learning achievement among high school students.

## 2. RESEARCH METHOD

### 2.1. Research Design

This study employed a quantitative approach using a correlational research design. A correlational design is appropriate for examining the relationships among variables that naturally occur without experimental manipulation [28]-[30]. The primary purpose of this design is to identify the extent to which parental attention and the physical learning environment are associated with students' Geography learning achievement. Through statistical analysis, the study seeks to determine both the individual and combined relationships among the variables under investigation. In addition, this research adopted a descriptive approach to provide a systematic overview of the characteristics of each variable. The descriptive component was used to portray the levels of parental attention, the quality of the physical learning environment, and students' Geography learning achievement. Data were collected and analyzed in a structured manner to ensure that the findings accurately reflected the conditions of the study population [31]-[33]. The combination of descriptive and correlational approaches enabled a comprehensive examination of the factors related to Geography learning achievement among high school students.

### 2.2. Population and Sample

The population of this study consisted of all students enrolled in Grade X and Grade XI Social Science classes at the selected senior high school. Grade XII students were excluded from the study because they were engaged in final examination activities during the data collection period, which could have affected their availability and participation. Therefore, Grade X and Grade XI students were considered representative of the target population. The total population comprised 141 students distributed across five classes. To obtain a representative sample, this study employed a proportional random sampling technique [34], [35]. This technique was chosen to ensure that each class contributed respondents proportionally according to its size within the population.

By applying proportional random sampling, every student had an equal opportunity to be selected while maintaining the proportional representation of each class. Such an approach helps minimize sampling bias and enhances the representativeness of the sample. The sample size was determined based on a sample size determination table with a 5% margin of error. For a population of approximately 150 students, the recommended sample size was 105 respondents. Accordingly, a total of 105 students were selected as research participants. The number of respondents drawn from each class was calculated proportionally by dividing the number of students in each class by the total population and then multiplying the result by the required sample size [36], [37]. This procedure ensured that the composition of the sample accurately reflected the distribution of students within the population.

### 2.3. Data Collection Technique

Data were collected using a structured questionnaire designed to measure the variables examined in this study, namely parental attention, physical learning environment, and Geography learning achievement. The questionnaire was selected because it enables researchers to obtain information from a relatively large number of respondents efficiently and systematically [38], [39]. In addition, this instrument facilitates the collection of standardized data, allowing for quantitative analysis of the relationships among variables. The questionnaire consisted of a series of written statements related to parental attention and the physical learning environment experienced by students. A closed-ended format was employed, in which respondents selected one of the predefined response options provided for each statement. This format was chosen to ensure consistency in responses, simplify data processing, and improve the reliability of the collected information. Through the administration of the questionnaire, data regarding students' perceptions of parental attention and the quality of their physical learning environment were obtained and subsequently analyzed to determine their relationships with Geography learning achievement.

### 2.4. Research Instrument

The instruments used in this study consisted of a structured questionnaire. The questionnaire was employed to collect data on parental attention and the physical learning environment, while documentation was used to obtain data on students' Geography learning achievement. The questionnaire was developed based on indicators derived from the theoretical framework of each variable and was designed to ensure that all dimensions relevant to the study objectives were adequately represented [40], [41]. The questionnaire utilized a modified four-point Likert scale to measure respondents' perceptions of parental attention and the physical learning environment. Respondents were asked to indicate the frequency with which they experienced each condition by selecting one of four response categories: Always, Often, Sometimes, or Never. Positive statements were scored from four to one, whereas negative statements were scored in reverse order. This scoring system allowed higher scores to reflect higher levels of parental attention and a more supportive physical learning environment.

Table 1. Scoring Scheme for Questionnaire Responses

Response Category	Positive Items	Negative Items
Always	4	1
Often	3	2
Sometimes	2	3
Never	1	4

To ensure systematic measurement, a blueprint of the research instrument was developed prior to data collection. The instrument for parental attention was constructed to capture various forms of parental involvement and support that may influence students' learning experiences [42], [43]. These dimensions included granting appropriate learning autonomy, providing rewards or disciplinary guidance, serving as role models, and assisting students when they encounter learning difficulties.

Table 2. Blueprint of the Parental Attention Instrument

Variable	Indicator	Item Numbers	Number of Items
Parental Attention	Providing learning autonomy	1, 2, 3, 4	4
	Providing rewards or disciplinary guidance	5, 6, 7, 8, 9, 10	6
	Serving as a role model	11, 12, 13, 14	4
	Assisting students with learning difficulties	15, 16, 17, 18	4
Total			18

The physical learning environment instrument was designed to assess the quality of students' study environments at home. The indicators focused on environmental conditions that may support or hinder learning activities, including lighting, air temperature, ventilation, study space, learning furniture, and noise levels.

Table 3. Blueprint of the Physical Learning Environment Instrument

Variable	Indicator	Item Numbers	Number of Items
Physical Learning Environment	Lighting	1, 2, 3	3
	Air temperature	4	1
	Ventilation	5	1
	Study space	6, 7, 8, 9	4
	Learning furniture	10	1
	Noise level	11, 12	2
Total			12

Overall, the questionnaire consisted of 30 items, including 18 items measuring parental attention and 12 items measuring the physical learning environment. The collected responses were converted into numerical scores and subsequently analyzed to determine the relationships between the independent variables and students' Geography learning achievement.

## 2.5. Data Analysis

Data analysis was conducted after all questionnaires had been collected, coded, and entered into the database. The analysis process consisted of descriptive and inferential statistical procedures. Descriptive statistics were used to summarize the characteristics of respondents and to describe the levels of parental attention, physical learning environment, and Geography learning achievement [27], [44]. The results were presented using frequency distributions, percentages, means, and standard deviations to provide an overview of the data. Prior to hypothesis testing, several statistical assumptions were examined to ensure the suitability of the analytical model. These included tests of normality, linearity, and multicollinearity. The normality test was performed to determine whether the data were normally distributed, while the linearity test was used to assess whether linear relationships existed between the independent and dependent variables. Multicollinearity testing was conducted to ensure that the independent variables were not excessively correlated with one another.

To address the research objectives, Pearson's Product-Moment Correlation analysis was employed to examine the relationships between parental attention, physical learning environment, and Geography learning achievement. The correlation coefficient ( $r$ ) was used to indicate both the strength and direction of the relationships among variables. Positive coefficients indicated a positive relationship, whereas negative coefficients indicated an inverse relationship. In addition, multiple linear regression analysis was conducted to determine the combined contribution of parental attention and the physical learning environment to Geography learning achievement. This analysis enabled the identification of the extent to which the independent variables jointly explained variations in

students' achievement. The coefficient of determination ( $R^2$ ) was used to assess the proportion of variance in Geography learning achievement explained by the predictor variables [45], [46].

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS). Statistical significance was evaluated at the 0.05 level. The interpretation of correlation coefficients followed commonly accepted guidelines, where coefficients below 0.30 indicated weak relationships, coefficients between 0.30 and 0.49 indicated moderate relationships, coefficients between 0.50 and 0.69 indicated strong relationships, and coefficients of 0.70 or above indicated very strong relationships.

Table 4. Interpretation of Correlation Coefficients

Correlation Coefficient (r)	Interpretation
0.00	No correlation
0.01 – 0.29	Weak
0.30 – 0.49	Moderate
0.50 – 0.69	Strong
0.70 – 0.99	Very Strong
1.00	Perfect correlation

The hypotheses were accepted when the significance value (p-value) was less than 0.05, indicating a statistically significant relationship between the variables under investigation.

### 3. RESULTS AND DISCUSSION

Based on data obtained from a questionnaire distributed to 105 respondents with 20 questions and four alternative answers, where four were for the highest score and one was for the lowest score.

Table 5. Distribution of Parental Attention Levels

No.	Score Range	Frequency (n)	Percentage (%)	Category
1	18–31	0	0.0	Very Low
2	32–45	46	43.8	Low
3	46–59	47	44.8	High
4	60–73	12	11.4	Very High
Total		105	100.0	

Based on Table 5 above, a pie chart can be created that illustrates the categories of parental concern. This pie chart is shown in Figure 1 below.

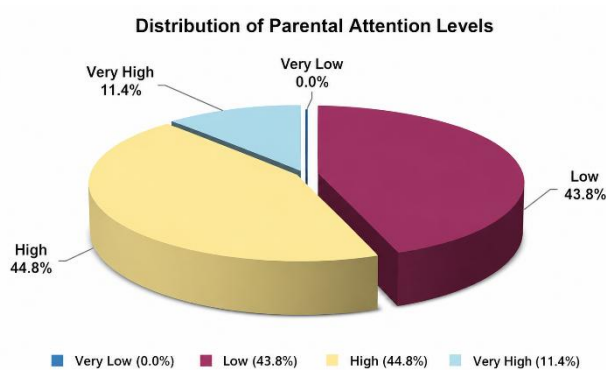


Figure 1. Parental Attention Category Pie Chart

The parental attention of the 105 students varied, but most could be categorized as high. Based on Figure 1 above, parental attention was categorized as very low (0.0%), medium (43.8%), high (44.8%), and very high (11.4%). In general, most parents could be categorized as high in their attention to their children (students). The respondents in this study were 105 students. Of these, 37.1% were male and 62.9% were female. The categories of parental concern based on gender are shown in Table 6 below.

Table 6. Distribution of Parental Attention Levels by Gender

Parental Attention Level	Male n (%)	Female n (%)	Total n (%)
Very Low	0 (0.0)	0 (0.0)	0 (0.0)
Low	18 (17.1)	28 (26.7)	46 (43.8)
High	17 (16.2)	30 (28.6)	47 (44.8)
Very High	4 (3.8)	8 (7.6)	12 (11.4)
Total	39 (37.1)	66 (62.9)	105 (100.0)

Table 6 shows the distribution of parental attention levels according to students' gender. Most male and female students reported parental attention in the high and low categories. Among male students, 17.1% were classified in the low category and 16.2% in the high category, while only 3.8% reported very high parental attention. Among female students, 28.6% were categorized as having high parental attention and 26.7% as having low parental attention, whereas 7.6% reported very high parental attention. No respondents from either gender were classified in the very low category. Overall, the findings indicate that parental attention was generally perceived at moderate to high levels among both male and female students, with female students reporting slightly higher levels of parental attention than male students.

Based on data obtained from a questionnaire distributed to 105 respondents, consisting of 12 questions and four answer alternatives, 73 of which had the highest score and one of which had the lowest score. The field data obtained the highest score of 45 and the lowest score of 21.

Table 7. Distribution of Physical Learning Environment Levels

No.	Score Range	Frequency (n)	Percentage (%)	Category
1	12–20	0	0.0	Very Poor
2	21–29	21	20.0	Poor
3	30–38	61	58.1	Good
4	39–47	23	21.9	Very Good
Total		105	100.0	

Table 7 presents the distribution of students' physical learning environment levels. The majority of respondents (58.1%) were classified in the Good category, indicating that most students had relatively supportive physical conditions for learning at home. Additionally, 21.9% of students reported a Very Good physical learning environment, while 20.0% were categorized as Poor. No respondents were classified in the Very Poor category. Overall, these findings suggest that the physical learning environment of most students was generally conducive to learning and may provide adequate support for academic activities, including Geography learning achievement.

Based on the table above, a pie chart can be created that illustrates the physical environment categories where students learn. The pie chart is shown in Figure 2 below.

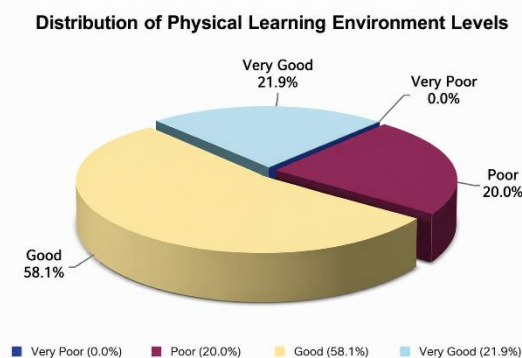


Figure 2. Pie Chart of Physical Environment Category of Learning Place

The physical environment where students study is mostly categorized as good. Based on Table 23 and Figure 2, the details are as follows: very poor (0.0%), poor (20.0%), good (58.1%), and very good (21.9%). The respondents in this study were 105 students. Of these, 37.1% were male and 62.9% were female. The physical environment categories for students' learning environments, based on gender, are shown in Table 8 below.

Table 8. Distribution of Physical Learning Environment Levels by Gender

Physical Learning Environment Level	Male n (%)	Female n (%)	Total n (%)
Very Poor	0 (0.0)	0 (0.0)	0 (0.0)
Poor	8 (7.6)	13 (12.4)	21 (20.0)
Good	23 (21.9)	38 (36.2)	61 (58.1)
Very Good	8 (7.6)	15 (14.3)	23 (21.9)
Total	39 (37.1)	66 (62.9)	105 (100.0)

Table 8 presents the distribution of physical learning environment levels according to students' gender. The majority of both male and female students were categorized as having a Good physical learning environment, accounting for 21.9% and 36.2% of the total sample, respectively. Furthermore, 21.9% of students were classified in the Very Good category, consisting of 7.6% males and 14.3% females. Only 20.0% of respondents reported a Poor physical learning environment, while no students were categorized as having a Very Poor environment. These findings indicate that most students experienced relatively favorable physical learning conditions at home, with female students slightly more represented in the good and very good categories than male students.

Students' Geography learning achievement was measured using secondary data, namely by examining documents owned by the Geography teacher. The documents were in the form of final semester exam scores for Geography teaching materials. The results of the field data showed that Geography learning achievement obtained the highest score (76) and the lowest score (34). Then, frequency calculations were carried out based on predetermined category limits. Further details can be seen in Table 9 below.

Table 9. Distribution of Geography Learning Achievement Levels

No.	Score Range	Frequency (n)	Percentage (%)	Category
1	0–55	82	78.1	Very Low
2	56–70	21	20.0	Low
3	71–85	2	1.9	High
4	86–100	0	0.0	Very High
Total		105	100.0	

Table 9 presents the distribution of students' Geography learning achievement levels. The majority of respondents (78.1%) were classified in the Very Low category, indicating that most students achieved scores below the expected performance level. An additional 20.0% of students were categorized as having Low achievement, while only 1.9% reached the High category. No students were classified in the Very High category. Overall, these findings suggest that Geography learning achievement among the surveyed students was generally low, highlighting the need to examine factors that may contribute to improving students' academic performance in Geography.

Based on Table 9 above, a pie chart can be created that illustrates the categories of student achievement in Geography. The pie chart is shown in the following figure.

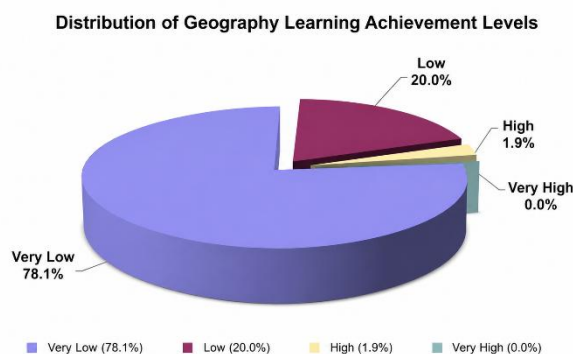


Figure. Pie Chart of Geography Learning Achievement Categories

The categories of students' Geography learning achievement according to Table 9 and Figure 3 are as follows: very low (78.1%), low (20.0%), high (1.9%), and none are in the very high category. This means that the majority of students have Geography learning achievement that is classified as very low.

Cross-tabulations provide more comprehensive information regarding students' geography achievement categories. This information includes: a review of geography achievement by gender, each category of parental attention, and each category of the physical learning environment.

The respondents in this study were 105 students. Of these, 37.1% were male and 62.9% were female. Geography learning achievement categories, based on gender, are shown in Table 10 below.

Table 10. Distribution of Geography Learning Achievement Levels by Gender

Geography Learning Achievement Level	Male n (%)	Female n (%)	Total n (%)
Very Low	29 (27.6)	53 (50.5)	82 (78.1)
Low	8 (7.6)	13 (12.4)	21 (20.0)
High	2 (1.9)	0 (0.0)	2 (1.9)
Very High	0 (0.0)	0 (0.0)	0 (0.0)
Total	39 (37.1)	66 (62.9)	105 (100.0)

Table 10 presents the distribution of Geography learning achievement levels by gender. The majority of students were classified in the Very Low achievement category, comprising 27.6% of male students and 50.5% of female students, accounting for 78.1% of the total sample. The Low achievement category included 7.6% of male students and 12.4% of female students, representing 20.0% of respondents. Only two students (1.9%) achieved the High category, both of whom were male, while no students were classified in the Very High category. These findings indicate that Geography learning achievement was generally low among both male and female students, with the overwhelming majority of respondents concentrated in the very low and low achievement categories.

Table 11. Cross-Tabulation of Geography Learning Achievement and Parental Attention Levels

Geography Learning Achievement	Very Low Parental Attention	Low Parental Attention	High Parental Attention	Very High Parental Attention	Total n (%)
Very Low	0 (0.0)	43 (41.0)	30 (28.6)	9 (8.6)	82 (78.1)
Low	0 (0.0)	3 (2.9)	16 (15.2)	2 (1.9)	21 (20.0)
High	0 (0.0)	0 (0.0)	1 (1.0)	1 (1.0)	2 (1.9)
Very High	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	0 (0.0)	46 (43.8)	47 (44.8)	12 (11.4)	105 (100.0)

Table 11 presents the cross-tabulation between parental attention levels and Geography learning achievement. Most students with low Geography achievement were concentrated in the low and high parental attention categories, accounting for 41.0% and 28.6% of the total sample, respectively. Similarly, students categorized as having low achievement were predominantly found in the high parental attention group (15.2%). Only two students achieved the high Geography achievement category, with one student belonging to the high parental attention group and one student belonging to the very high parental attention group. Overall, the distribution suggests a tendency for students receiving higher levels of parental attention to achieve better Geography learning outcomes, although statistical analysis is required to determine whether the relationship is significant.

Table 12. Cross-Tabulation of Geography Learning Achievement and Physical Learning Environment Levels

Geography Learning Achievement	Very Poor Environment	Poor Environment	Good Environment	Very Good Environment	Total n (%)
Very Low	0 (0.0)	19 (18.1)	50 (47.6)	13 (12.4)	82 (78.1)
Low	0 (0.0)	2 (1.9)	11 (10.5)	8 (7.6)	21 (20.0)
High	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.9)	2 (1.9)
Very High	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	0 (0.0)	21 (20.0)	61 (58.1)	23 (21.9)	105 (100.0)

Table 12 presents the distribution of Geography learning achievement according to the quality of the physical learning environment. Most students classified in the Very Low Geography achievement category were found within the Good physical learning environment group (47.6%), followed by the Poor (18.1%) and Very Good (12.4%) categories. Among students with Low Geography achievement, the majority were also concentrated in the Good physical learning environment category (10.5%), while 7.6% were associated with a Very Good environment. Notably, the only students who achieved the High Geography achievement category were found

exclusively within the Very Good physical learning environment group (1.9%). No students from the Poor or Good environment categories reached this achievement level. Although most respondents were concentrated in the lower achievement categories, the distribution suggests that students who experienced more favorable physical learning environments tended to demonstrate better Geography learning outcomes. Nevertheless, further statistical analyses, including correlation and regression tests, are necessary to determine whether the observed relationship is statistically significant.

Prior to conducting the correlation and regression analyses, a normality test was performed to determine whether the data met the assumptions required for parametric statistical analysis. The normality of the data distribution was assessed using the Kolmogorov–Smirnov (K–S) test. A variable was considered normally distributed when the significance value ( $p$ ) exceeded 0.05.

Table 13. Results of the Normality Test

Variable	Statistic	Sig.
Parental Attention	1.246	.090
Physical Learning Environment	0.678	.747
Geography Learning Achievement	1.201	.112

The results of the Kolmogorov–Smirnov test indicated that all study variables were normally distributed. The  $p$ -values for parental attention, physical learning environment, and Geography learning achievement were 0.090, 0.747, and 0.112, respectively, all of which exceeded the significance threshold of 0.05. These findings demonstrate that the sample data adequately approximated a normal distribution. Therefore, the assumptions for applying parametric statistical techniques were satisfied, and subsequent analyses using Pearson correlation and multiple linear regression could be conducted.

Before performing correlation and regression analyses, a linearity test was conducted to determine whether the relationships between the independent variables and the dependent variable followed a linear pattern. Establishing linearity is important because Pearson correlation and linear regression assume that the associations among variables can be adequately represented by a straight-line relationship. The test was conducted by examining the deviation from linearity, where a significance value ( $p$ ) greater than 0.05 indicates that the relationship can be considered linear.

Table 14. Results of the Linearity Test

Independent Variable	df	F-value	p-value	Interpretation
Parental Attention ( $X_1$ )	27; 76	1.099	0.364	Linear
Physical Learning Environment ( $X_2$ )	21; 82	1.386	0.150	Linear

The results presented in Table 14 indicate that both independent variables exhibited linear relationships with Geography learning achievement. The relationship between parental attention and Geography learning achievement produced an F-value of 1.099 with a significance value of 0.364, while the relationship between the physical learning environment and Geography learning achievement yielded an F-value of 1.386 with a significance value of 0.150. Since both significance values exceeded the threshold of 0.05, the relationships were considered linear. Therefore, the assumption of linearity was satisfied, supporting the use of Pearson correlation and multiple linear regression analyses in this study.

A multicollinearity test was conducted to determine whether a high degree of correlation existed between the independent variables included in the regression model. Multicollinearity can affect the stability and interpretation of regression coefficients, thereby reducing the reliability of the model. In this study, multicollinearity was assessed using the correlation coefficient between independent variables and the Variance Inflation Factor (VIF). A model was considered free from multicollinearity when the correlation coefficient between independent variables was below 0.80 and the VIF value was less than 5.00.

Table 15. Results of the Multicollinearity Test

Variable	Correlation with Other Independent Variable ( $r$ )	VIF	Interpretation
Parental Attention ( $X_1$ )	0.206	1.044	No multicollinearity
Physical Learning Environment ( $X_2$ )	0.206	1.044	No multicollinearity

The results presented in Table 15 indicate that the correlation between parental attention and the physical learning environment was 0.206, which is substantially below the threshold value of 0.80. In addition, both independent variables produced a VIF value of 1.044, well below the critical value of 5.00. These findings suggest that no multicollinearity problem existed among the predictor variables. Therefore, the independent variables were sufficiently distinct from one another and could be included simultaneously in the multiple regression model.

Consequently, the assumptions required for multiple linear regression analysis were satisfied, allowing further hypothesis testing to be conducted.

The first hypothesis examined the relationship between parental attention and Geography learning achievement. Pearson correlation and simple linear regression analyses were conducted to determine the strength, direction, and significance of the relationship.

Table 16. Results of Correlation and Regression Analysis Between Parental Attention and Geography Learning Achievement

Variable	Regression Coefficient ( $\beta$ )	Correlation Coefficient ( $r$ )	Coefficient of Determination ( $R^2$ )	df	t-value	p-value
Constant	27.040	–	–	–	–	–
Parental Attention ( $X_1$ )	0.667	0.425	0.180	103	4.760	< 0.001

Table 16 presents the results of the correlation and regression analyses examining the relationship between parental attention and Geography learning achievement among high school students. The findings indicate that parental attention has a positive and statistically significant relationship with Geography learning achievement ( $r = 0.425$ ,  $t = 4.760$ ,  $p < 0.001$ ). Since the significance value is below 0.05, the relationship is considered statistically significant, indicating that the observed association is unlikely to have occurred by chance. The correlation coefficient ( $r = 0.425$ ) demonstrates a moderate positive relationship between the two variables. This result suggests that students who receive higher levels of parental attention tend to achieve better academic outcomes in Geography. Parental attention may contribute to students' learning by providing academic guidance, monitoring study activities, offering encouragement, and creating a supportive learning atmosphere at home.

Furthermore, the coefficient of determination ( $R^2 = 0.180$ ) indicates that parental attention explains approximately 18.0% of the variation in Geography learning achievement. Although this contribution is meaningful, it also suggests that a large proportion of students' achievement (82.0%) is influenced by other factors, such as learning motivation, teaching quality, study habits, peer influence, learning resources, and school environment. The regression coefficient ( $\beta = 0.667$ ) further confirms the positive influence of parental attention on academic performance. The regression equation,  $\hat{Y} = 27.040 + 0.667X_1$ , indicates that each one-unit increase in parental attention is associated with an estimated increase of 0.667 points in Geography learning achievement. Therefore, strengthening parental involvement and support may contribute to improving students' academic performance in Geography. Overall, these findings support the first hypothesis that parental attention is positively and significantly associated with Geography learning achievement among high school students. The results emphasize the importance of parental engagement as one of the key factors contributing to students' educational success.

Table 17. Results of Correlation and Regression Analysis Between Physical Learning Environment and Geography Learning Achievement

Variable	Regression Coefficient ( $\beta$ )	Correlation Coefficient ( $r$ )	Coefficient of Determination ( $R^2$ )	df	t-value	p-value
Constant	24.747	–	–	–	–	–
Physical Learning Environment ( $X_2$ )	0.525	0.466	0.217	103	5.343	< 0.001

Table 17 presents the results of the correlation and regression analyses examining the relationship between the physical learning environment and Geography learning achievement among high school students. The analysis shows that the physical learning environment is positively and significantly related to Geography learning achievement, as indicated by a correlation coefficient of  $r = 0.466$  and a significance value of  $p < 0.001$ . Because the significance level is below 0.05, the second hypothesis is accepted, indicating that the relationship observed in the sample is statistically significant and can be generalized to the population with a 95% confidence level.

The correlation coefficient ( $r = 0.466$ ) indicates a moderate positive relationship between the physical learning environment and Geography learning achievement. This finding suggests that students who have more supportive learning environments at home tend to achieve higher academic performance in Geography. A conducive learning environment, characterized by adequate lighting, proper ventilation, comfortable temperature, suitable study space, and minimal noise disturbances, may help students concentrate more effectively and engage more actively in learning activities.

The coefficient of determination ( $R^2 = 0.217$ ) indicates that approximately 21.7% of the variance in Geography learning achievement can be explained by the physical learning environment. In other words, the quality of students' study environments contributes meaningfully to their academic performance. However, the remaining 78.3% of the variance is influenced by other factors that were not examined in this study, such as

learning motivation, cognitive ability, instructional quality, study habits, peer support, and school-related factors. The regression coefficient ( $\beta = 0.525$ ) further confirms the positive contribution of the physical learning environment to Geography learning achievement. The regression equation can be expressed as:

$$\hat{Y} = 24.747 + 0.525X_2$$

where  $\hat{Y}$  represents the predicted Geography learning achievement score and  $X_2$  represents the physical learning environment score. This equation indicates that every one-point increase in the physical learning environment score is associated with an estimated increase of 0.525 points in Geography learning achievement. Therefore, improving the quality of students' physical learning environments may contribute to better academic outcomes in Geography. Overall, these results support the second hypothesis and highlight the importance of providing a conducive physical learning environment as a factor that enhances students' Geography learning achievement.

Table 18. Results of Multiple Regression Analysis for the Combined Effects of Parental Attention and Physical Learning Environment on Geography Learning Achievement

Variable	Regression Coefficient ( $\beta$ )	Multiple Correlation (R)	Coefficient of Determination ( $R^2$ )	df	F-value	p-value
Constant	10.259	-	-	-	-	-
Parental Attention ( $X_1$ )	0.445	0.574	0.330	2;	25.105	< 0.001
Physical Learning Environment ( $X_2$ )	0.539			102		

Table 18 presents the results of the multiple regression analysis examining the combined effects of parental attention and the physical learning environment on Geography learning achievement. The analysis revealed a statistically significant regression model ( $F = 25.105, p < 0.001$ ), indicating that parental attention and the physical learning environment jointly predict students' Geography learning achievement. Since the significance value is below 0.05, the third hypothesis is accepted, confirming that both variables collectively have a significant relationship with Geography learning achievement.

The multiple correlation coefficient ( $R = 0.574$ ) indicates a moderately strong positive relationship between the set of independent variables and Geography learning achievement. This result suggests that students who receive greater parental attention and experience more supportive physical learning environments tend to achieve better academic outcomes in Geography.

The coefficient of determination ( $R^2 = 0.330$ ) indicates that approximately 33.0% of the variance in Geography learning achievement can be explained jointly by parental attention and the physical learning environment. This proportion is greater than the contribution of either variable individually, demonstrating the importance of considering both family and environmental factors simultaneously when examining academic achievement. Nevertheless, approximately 67.0% of the variance remains unexplained by the model and may be attributable to other factors, such as learning motivation, cognitive ability, instructional quality, peer influence, and school-related conditions. The resulting regression equation is:

$$\hat{Y} = 10.259 + 0.445X_1 + 0.539X_2$$

where  $\hat{Y}$  represents the predicted Geography learning achievement score,  $X_1$  represents parental attention, and  $X_2$  represents the physical learning environment. The regression coefficients indicate that both predictor variables contribute positively to Geography learning achievement. Specifically, a one-unit increase in parental attention is associated with an estimated increase of 0.445 points in Geography learning achievement, while a one-unit increase in the physical learning environment score is associated with an estimated increase of 0.539 points, assuming the other variable remains constant. Overall, the findings demonstrate that Geography learning achievement is influenced not only by family involvement but also by the quality of students' study environments. The combined influence of these variables provides stronger explanatory power than either factor alone, highlighting the importance of fostering both parental support and conducive learning conditions at home.

Table 19. Relative and Effective Contributions of the Independent Variables

Independent Variable	Relative Contribution (%)	Effective Contribution (%)
Parental Attention	55.81	18.42
Physical Learning Environment	44.19	14.58
Total	100.00	33.00

Table 19 shows the relative and effective contributions of each independent variable to Geography learning achievement. The effective contribution of parental attention was 18.42%, whereas the physical learning environment contributed 14.58%. Together, these variables accounted for 33.00% of the variance in Geography learning achievement, consistent with the coefficient of determination obtained from the multiple regression analysis. In terms of relative contribution, parental attention accounted for 55.81% of the explained variance, while the physical learning environment accounted for 44.19%. These results indicate that parental attention was the more influential predictor of Geography learning achievement within the regression model. Although both variables significantly contributed to students' achievement, parental attention played a slightly greater role than the physical learning environment. These findings suggest that enhancing parental involvement through academic support, guidance, supervision, and encouragement may be particularly effective in improving students' Geography learning achievement. At the same time, efforts to create supportive physical learning environments remain important, as both factors work together to promote better educational outcomes.

The findings of this study indicate that parental attention plays an important role in supporting students' Geography learning achievement. Rather than merely providing academic supervision, parental attention creates a supportive learning climate that encourages students to develop responsibility, learning discipline, and persistence in completing academic tasks. Students who receive consistent guidance and encouragement from their parents are more likely to maintain positive learning habits and demonstrate stronger engagement in learning activities [46], [47]. Within the context of Geography education, parental support may help students allocate sufficient time for studying, develop interest in geographical issues, and remain motivated when facing challenging learning materials. Consequently, parental attention serves not only as an external source of support but also as a factor that indirectly strengthens students' self-regulation and academic commitment [48], [49].

The positive role of parental attention found in this study is consistent with previous research highlighting the importance of family involvement in students' academic development. Jeynes [11] reported that parental expectations and involvement contribute significantly to students' academic success across various educational levels. Similarly, Wilder [10] concluded through a meta-synthesis that parental involvement consistently demonstrates positive effects on student achievement. Yang et al. [42] further emphasized that parental involvement enhances student engagement, which subsequently influences academic performance. These findings suggest that the family environment remains a fundamental educational context in which students acquire motivation, confidence, and learning support necessary for achieving academic success. Therefore, the present study extends previous evidence by demonstrating that the influence of parental attention is also evident within the specific domain of Geography learning achievement.

The study also revealed the importance of the physical learning environment in supporting students' Geography learning achievement. A conducive learning environment provides students with opportunities to concentrate effectively, minimize distractions, and engage more deeply with learning materials [50], [51]. Geography often requires students to interpret maps, analyze spatial information, and understand environmental phenomena, all of which demand sustained attention and cognitive engagement. Therefore, learning conditions characterized by adequate lighting, proper ventilation, comfortable study spaces, and reduced noise levels may facilitate more effective learning experiences. The quality of the physical learning environment can influence students' comfort and concentration, which are essential prerequisites for meaningful learning and academic performance [52]-[54].

This finding is supported by previous studies emphasizing the relationship between learning environments and educational outcomes. Baba et al. [14] found that favorable indoor environmental conditions contribute positively to learning comfort and academic performance. Brink et al. [15] similarly reported that classroom environmental quality influences students' learning effectiveness and achievement. Furthermore, Bustamante-Mora et al. [16] demonstrated that environmental conditions significantly affect students' concentration and learning processes. These studies collectively indicate that educational achievement is influenced not only by instructional factors but also by the quality of the physical spaces in which learning occurs. The present study confirms that such environmental influences remain relevant within home-based learning contexts and specifically affect Geography learning achievement.

An important contribution of this study lies in demonstrating the combined influence of parental attention and the physical learning environment on Geography learning achievement. The findings support ecological perspectives of learning, which propose that academic achievement is shaped by multiple interconnected systems rather than a single factor [55]-[57]. Family support and learning environments complement one another in creating conditions that facilitate effective learning. Parental attention may provide motivational and emotional support, while a conducive physical learning environment offers practical conditions that enable students to translate motivation into productive learning behaviors [58]-[60]. Therefore, efforts to improve student achievement should not focus exclusively on individual student characteristics but should also consider family engagement and environmental support as interconnected components of the educational process.

The findings are also consistent with the ecological systems perspective proposed in recent educational studies. Lin et al. [25] argued that students' academic development is influenced by multiple environmental factors

operating simultaneously across different contexts. Likewise, An et al. [24] demonstrated that family-related resources contribute significantly to Geography-related academic achievement. The present study strengthens this body of literature by providing empirical evidence that parental attention and physical learning environments jointly contribute to Geography learning outcomes among high school students. Such findings reinforce the importance of adopting a holistic approach when developing educational interventions aimed at improving student achievement.

From a practical perspective, this study has several important implications. For schools, the findings highlight the need to strengthen communication and collaboration with parents through regular academic monitoring, parental involvement programs, and educational workshops that increase parents' awareness of their role in supporting student learning. For parents, the results emphasize that active attention, encouragement, and guidance remain important determinants of academic success even at the secondary school level. Furthermore, policymakers may consider developing educational initiatives that promote supportive home learning environments, particularly for students from disadvantaged backgrounds who may face limitations in accessing adequate study facilities. Such efforts could contribute to reducing educational inequalities and improving student learning outcomes more broadly.

Despite its contributions, this study has several limitations that should be acknowledged. First, the study employed a correlational design, which does not permit causal conclusions regarding the relationships among variables. Although significant associations were identified, it cannot be definitively stated that parental attention or the physical learning environment directly causes improvements in Geography learning achievement. Second, the study was conducted within a single school context and involved a relatively limited sample size, which may restrict the generalizability of the findings to other educational settings. Third, the model explained only 33% of the variance in Geography learning achievement, indicating that a substantial proportion of achievement is influenced by other factors not examined in this study, such as learning motivation, self-regulated learning, academic self-efficacy, teacher quality, peer influence, digital literacy, and socioeconomic status. Future research is therefore recommended to incorporate these additional variables, employ larger and more diverse samples, and utilize longitudinal or experimental designs to provide a deeper understanding of the mechanisms underlying Geography learning achievement.

#### 4. CONCLUSION

This study found that parental attention has a positive and significant relationship with Geography learning achievement among high school students ( $r = 0.425$ ,  $p < 0.05$ ). Students who receive greater attention, guidance, and support from their parents tend to achieve better academic outcomes in Geography. The findings highlight the important role of parental involvement in supporting students' learning processes and academic success. The study also revealed a positive and significant relationship between the physical learning environment and Geography learning achievement ( $r = 0.466$ ,  $p < 0.05$ ). A more conducive learning environment, characterized by adequate study facilities and favorable physical conditions, was associated with higher levels of student achievement. This result emphasizes the importance of providing supportive learning spaces for effective study activities.

Furthermore, parental attention and the physical learning environment jointly demonstrated a positive and significant relationship with Geography learning achievement ( $R = 0.574$ ,  $p < 0.05$ ). Together, these variables explained 33.0% of the variance in students' achievement. Among the two predictors, parental attention contributed more substantially (18.42%) than the physical learning environment (14.58%), indicating that parental involvement is the most influential factor in improving Geography learning achievement among the variables examined in this study.

#### ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to all students who participated in this study and to the school administration for their cooperation and support during the data collection process. The authors also appreciate the valuable assistance provided by colleagues and reviewers whose feedback contributed to the improvement of this research. Their support and contributions were instrumental in the successful completion of this study.

#### REFERENCES

- [1] P. Sonnum and W. Worapun, "Enhancing grade 5 student geography skills and learning achievement: A problem-based learning approach," *J. Educ. Learn.*, vol. 12, no. 5, pp. 188–196, 2023, doi: 10.5539/jel.v12n5p188.
- [2] S. E. Manakane, P. C. Latue, and H. Rakuasa, "Integrating geospatial technology in learning: An innovation to improve understanding of geography concepts," *Sinergi Int. J. Educ.*, vol. 1, no. 2, pp. 60–74, 2023, doi: 10.61194/education.v1i2.70.
- [3] T. Larsen, M. Gerike, and J. Harrington, "Human-environment thinking and K-12 geography education," *J. Geog.*, vol.

- 121, no. 1, pp. 34–46, 2022, doi: 10.1080/00221341.2021.2005666.
- [4] T. Bendl, L. Krajiňáková, M. Marada, and D. Rezníčková, “Geographical thinking in geography education: A systematic review,” *Int. Res. Geogr. Environ. Educ.*, vol. 34, no. 4, pp. 326–352, 2025, doi: 10.1080/10382046.2024.2354097.
- [5] A. Mishra, A. Mishra, and G. Pandey, “Spatial inequality and education: Unraveling the geographical dimensions of educational disparities,” *Technolearn An Int. J. Educ. Technol.*, vol. 13, no. 1, pp. 29–43, 2023, doi: 10.30954/2231-4105.01.2023.6.
- [6] B. Wijayanto, S. Sumarmi, D. H. Utomo, B. Handoyo, and M. Aliman, “Problem-based learning using e-module: Does it effect on student’s high order thinking and learning interest in studying geography?,” *J. Technol. Sci. Educ.*, vol. 13, no. 3, pp. 613–631, 2023, doi: 10.3926/jotse.1965.
- [7] N. Singh and D. Vig, “The power of parental encouragement : A review of its impact on senior secondary students,” *Int. J. Educ. Manag. Stud.*, vol. 15, no. 1, pp. 160–163, 2025.
- [8] L. Hakim, N. Nawaji, and R. A. B. Kusufa, “The influence of parental attention , motivation and student learning facilities on students learning outcomes,” in *Proceedings of International Conference on Applied Social Science in Education 2024*, 2024, pp. 480–491. doi: 10.31316/icasse.v1i1.7037.
- [9] I. K. A. Hafid, D. Darmawang, and M. Mantasia, “The influence of teacher competence, parental attention, on student Learning motivation at vocational schools in Makassar,” *Educ. Hum. Dev. J.*, vol. 10, no. 3, pp. 375–388, 2024, doi: 10.33086/ehdj.v10i3.8264.
- [10] S. Wilder, “Effects of parental involvement on academic achievement: a meta-synthesis,” *Mapp. F.*, vol. 66, no. 3, pp. 137–157, 2023, doi: 10.4324/9781003403722-12.
- [11] W. H. Jeynes, “A meta-analysis: The relationship between the parental expectations component of parental involvement with students’ academic achievement,” *Urban Educ.*, vol. 59, no. 1, pp. 63–95, Jan. 2024, doi: 10.1177/00420859211073892.
- [12] M. Beyene and A. Asgedom, “A comparative study of parent engagement in homework: The case of private and government secondary schools in addis ababa,” *Int. J. Progress. Educ.*, vol. 21, no. 2, pp. 16–28, 2025, doi: 10.29329/ijpe.2025.1298.2.
- [13] F. D. Harjanti, Suhartono, R. Ardiansyah, and S. Suryandari, “Implementing the Pancasila Student Profile through the Merdeka Curriculum: A case study from Surabaya in advancing SDG 4,” *Soc. Sci. Humanit. Open*, vol. 13, pp. 1–7, 2026, doi: 10.1016/j.ssaho.2026.102728.
- [14] A. Baba, I. Shahrou, and M. Baba, “Indoor environmental quality for comfort learning environments: Case study of Palestinian school buildings,” *Buildings*, vol. 14, no. 5, pp. 1–17, 2024, doi: 10.3390/buildings14051296.
- [15] H. W. Brink, S. C. M. Lechner, M. G. L. C. Loomans, M. P. Mobach, and H. S. M. Kort, “Understanding how indoor environmental classroom conditions influence academic performance in higher education,” *Facilities*, vol. 42, no. 3–4, pp. 185–200, 2024, doi: 10.1108/F-12-2022-0164.
- [16] A. Bustamante-Mora, M. Diéguez-Rebolledo, M. Zegarra, F. Escobar, and G. Epuyao, “Environmental conditions and their impact on student concentration and learning in university environments: A case study of education for sustainability,” *Sustain.*, vol. 17, no. 3, pp. 1–32, 2025, doi: 10.3390/su17031071.
- [17] H. A. Dalimunthe, I. K. Dewi, Y. Yunita, F. Faadhil, and D. M. G. S. Lubis, “Building a supportive learning environment: The role of psychology in increasing student motivation and engagement,” *OPSearch Am. J. Open Res.*, vol. 3, no. 4, pp. 934–939, 2024, doi: 10.58811/opsearch.v3i4.107.
- [18] G. Papaioannou, M. Volakaki, S. Kokolakis, and D. Vouyioukas, “Learning spaces in higher education : A state-of-the-art review,” *Trends High. Educ.*, vol. 2, pp. 526–545, 2023, doi: 10.3390/higheredu2030032.
- [19] C. O. Nja *et al.*, “Learning space, students’ collaboration, educational outcomes, and interest: Exploring the physical, social and psychological mediators,” *Heliyon*, vol. 9, no. 4, pp. 1–10, 2023, doi: 10.1016/j.heliyon.2023.e15456.
- [20] S. C. Azhari, Siti Fadjarajani, and Ely Satiyah Rosali, “The relationship between self-regulated learning, family support and learning motivation on students’ learning engagement,” *J. Educ. Res. Eval.*, vol. 7, no. 1, pp. 147–158, 2023, doi: 10.23887/jere.v7i1.52481.
- [21] P. Wang, F. Wang, and Z. Li, “Exploring the ecosystem of K-12 online learning: an empirical study of impact mechanisms in the post-pandemic era,” *Front. Psychol.*, vol. 14, no. September, pp. 1–17, 2023, doi: 10.3389/fpsyg.2023.1241477.
- [22] X. Yu *et al.*, “Academic achievement is more closely associated with student-peer relationships than with student-parent relationships or student-teacher relationships,” *Front. Psychol.*, vol. 14, no. February, pp. 1–15, 2023, doi: 10.3389/fpsyg.2023.1012701.
- [23] S. C. Azhari, E. S. Rosali, M. F. Firmansyah, and H. Z. Maulana, “Investigating family and peer support on learning habits and achievements in online learning,” *JINOTEP (Jurnal Inov. dan Teknol. Pembelajaran) Kaji. dan Ris. Dalam Teknol. Pembelajaran*, vol. 9, no. 2, pp. 136–144, 2022, doi: 10.17977/um031v9i22022p136.
- [24] Z. An, J. Ge, Y. Xu, X. Liang, J. Zhang, and M. Oubibi, “Exploring the mediating effect of creativity on the relationship between family capital and academic achievement in geography,” *Sci. Rep.*, vol. 13, no. 1, pp. 1–11, 2023, doi: 10.1038/s41598-023-48833-8.
- [25] L. Lin, D. Zhou, X. Hu, J. Wang, and Y. Wang, “Multiple factors drive the development of scientific thinking in urban primary school students of China: FsQCA analysis based on the ecological systems Theory,” *Educ. Urban Soc.*, vol. 56, no. 7, pp. 906–927, Sep. 2024, doi: 10.1177/00131245241229666.
- [26] L. O. L. Banda, J. Liu, J. T. Banda, and W. Zhou, “Impact of ethnic identity and geographical home location on student academic performance,” *Heliyon*, vol. 9, no. 6, pp. 1–18, 2023, doi: 10.1016/j.heliyon.2023.e16767.
- [27] J. Zhang *et al.*, “The mediating effect of geospatial thinking on the relationship between family capital and academic achievement in geography,” *Front. Psychol.*, vol. 14, pp. 1–12, 2023, doi: 10.3389/fpsyg.2023.1067198.
- [28] B. Devi, R. Devi, S. Pradhan, D. Giri, N. Lepcha, and S. Basnet, “Application of correlational research design in nursing and medical Research,” *Barkha Devi Ranjita Devi Shrijana Pradhan Doma Giri Nazung Lepcha Shakeela Basnet*, vol.

- 65, no. 11, pp. 60–69, 2022, doi: 10.17605/OSF.IO/YRZ68.
- [29] P. Pandey, M. Madhusudhan, and B. P. Singh, “Quantitative research approach and its applications in library and information science research,” *Access An Int. J. Nepal Libr. Assoc.*, vol. 2, no. 01, pp. 77–90, 2023, doi: 10.3126/access.v2i01.58895.
- [30] T. Tanti, K. Anwar, J. Jamaluddin, A. S. Saleh, D. K. Yusup, and M. Jahanifar, “Faith meets technology: Navigating student satisfaction in Indonesia’s Islamic higher education online learning,” *J. Ilm. Ilmu Terap. Univ. Jambi*, vol. 9, no. 2, pp. 695–708, 2025, doi: 10.22437/jiituj.v9i2.41513.
- [31] B. T. Khoa, B. P. Hung, and M. H. Brahmi, “Qualitative research in social sciences: Data collection, data analysis and report writing,” *Int. J. Public Sect. Perform. Manag.*, vol. 12, no. 1/2, pp. 187–209, 2023, doi: 10.1504/IJPSPM.2023.132247.
- [32] C. Mckim, “Meaningful member-checking : A structured approach to member- checking,” *Am. J. Qual. Res.*, vol. 7, no. 2, pp. 41–52, 2023, doi: 10.29333/ajqr/12973.
- [33] N. Mulyani, T. Tanti, and P. Murni, “The effect of problem-based learning on students’ conceptual understanding reviewed from students’ beliefs,” *JIPF (Jurnal Ilmu Pendidik. Fis.)*, vol. 10, no. 2, pp. 208–216, 2025, doi: 10.26737/jipf.v10i2.6191.
- [34] A. Marradi, “Representative samples, random sampling,” *Cambio. Riv. sulle Trasformazioni Soc.*, vol. 12, no. 23, pp. 213–233, 2022, doi: 10.36253/cambio-12691.
- [35] X. Wang, “Use of proper sampling techniques to research studies,” *Appl. Comput. Eng.*, vol. 57, no. 1, pp. 141–145, 2024, doi: 10.54254/2755-2721/57/20241324.
- [36] S. Şanlı, “Sampling methods and appropriate sample size determination: A concise overview,” *Pamukkale Univ. J. Soc. Sci. Inst.*, vol. 56, no. 1988, pp. 1–19, 2023, doi: 10.30794/pausbed.1117138.
- [37] D. A. Latif, S. Zaka, and W. Ali, “Teachers stress and its impact on their self-efficacy: An evidence from okara district,” *Bull. Bus. Econ.*, vol. 12, no. 3, pp. 253–259, 2023, doi: 10.61506/01.00030.
- [38] H. Sharma, “How short or long should be a questionnaire for any research? Researchers dilemma in deciding the appropriate questionnaire length,” *Saudi J. Anaesth.*, vol. 16, no. 1, pp. 65–68, 2022, doi: 10.4103/sja.sja\_163\_21.
- [39] H. R. Ganesha and P. S. Aithal, “How to choose an appropriate research data collection method and method choice among various research data collection methods and method choices during Ph.D. program in India?,” *Int. J. Manag. Technol. Soc. Sci.*, vol. 7, no. 2, pp. 455–489, 2022, doi: 10.47992/ijmts.2581.6012.0233.
- [40] R. O. Salawu, A.-O. S. Bolatitio, and S. Masibo, “Theoretical and conceptual frameworks in research: Conceptual clarification,” *Eur. Chem. Bull.*, vol. 12, no. 12, pp. 2103–2117, 2023.
- [41] I. Hristov, A. Appolloni, and A. Chirico, “The adoption of the key performance indicators to integrate sustainability in the business strategy: A novel five-dimensional framework,” *Bus. Strateg. Environ.*, vol. 31, no. 7, pp. 3216–3230, 2022, doi: 10.1002/bse.3072.
- [42] D. Yang, P. Chen, K. Wang, Z. Li, C. Zhang, and R. Huang, “Parental involvement and student engagement: A review of the literature,” 2023. doi: 10.3390/su15075859.
- [43] E. Susanto, D. Putra, and S. K. Nisak, “The influence of parental attention on student learning achievement in elementary school,” *EDUSOSHUM J. Islam. Educ. Soc. Humanit.*, vol. 4, no. 2, pp. 155–167, 2024, doi: 10.70152/leotech.v1i1.4.
- [44] Y. Xin and L. Yu, “The influence of parents’ educational expectations on children’s development: The chain mediation role of educational anxiety and parental involvement,” *Behav. Sci. (Basel)*, vol. 14, no. 9, pp. 1–17, 2024, doi: 10.3390/bs14090779.
- [45] S. Sohrab, N. Csikós, and P. Szilassi, “Effect of geographical parameters on PM10 pollution in European landscapes: A machine learning algorithm-based analysis,” *Environ. Sci. Eur.*, vol. 36, no. 1, pp. 1–20, 2024, doi: 10.1186/s12302-024-00972-z.
- [46] R. Jafar, A. Awad, I. Hatem, K. Jafar, E. Awad, and I. Shahrour, “Multiple linear regression and machine learning for predicting the drinking water quality index in ai-seine lake,” *Smart Cities*, vol. 6, no. 5, pp. 2807–2827, 2023, doi: 10.3390/smartcities6050126.
- [47] Y. Shao and S. Kang, “The link between parent–child relationship and learning engagement among adolescents: The chain mediating roles of learning motivation and academic self-efficacy,” *Front. Educ.*, vol. 7, pp. 1–11, 2022, doi: 10.3389/educ.2022.854549.
- [48] L. Song, Q. Zhan, L. S. Cao, and R. Luo, “Parent autonomy support and undergraduates’ academic engagement in online learning: the mediate role of self-regulation,” *Psicol. Reflex. e Crit.*, vol. 37, no. 1, pp. 1–11, 2024, doi: 10.1186/s41155-024-00330-1.
- [49] Y. Zhang and X. Ren, “Do resilience and performance goals mediate the relationship between parental educational support and Chinese high school students’ self-regulated learning? - based on the social cognitive Theory,” *Psychol. Sch.*, vol. 62, no. 8, pp. 2742–2754, Aug. 2025, doi: 10.1002/pits.23496.
- [50] F. V. Bresenio, “Learners’ perceptions of the physical classroom environment and its role in promoting positive learning behavior,” *Int. J. Open-access, Interdiscip. New Educ. Discov. ETCOR Educ. Res. Cent. (iJOINED ETCOR)*, vol. 4, no. 1, pp. 611–632, 2025, doi: 10.63498/nx2st241.
- [51] F. Hysa and M. Agani, “Students’ perception, concentration, and attention in learning and teachers’ challenging approaches for effective and efficient learning: The social context, the influence of social networks, and technology have changed the learning environment and the ne,” *Edelweiss Appl. Sci. Technol.*, vol. 9, no. 4, pp. 766–778, Apr. 2025, doi: 10.55214/25768484.v9i4.6077.
- [52] I. K. Gaisey, A. Ntoaduro, J. Asamoah-gyawu, G. Yeboah, and G. A. Mensah, “Impact of positive learning environment on students’ academic performance in colleges of education,” *Can. J. Educ. Soc. Stud.*, vol. 5, no. 1, pp. 238–253, 2025, doi: 10.53103/cjess.v5i1.306.
- [53] M. Qadeer, E. Mustafa, S. Arshad, and M. Malaika, “The influence of classroom environment on undergraduate student learning outcomes,” *Int. Res. J. Arab. Islam. Stud.*, vol. 04, no. 2, pp. 54–67, 2024.

- [54] T. Tanti, A. Astalini, D. A. Kurniawan, D. Darmaji, T. O. Puspitasari, and I. Wardhana, "Attitude for physics: The condition of high school students," *J. Pendidik. Fis. Indones.*, vol. 17, no. 2, pp. 126–132, 2021, doi: 10.15294/jpfi.v17i2.18919.
- [55] S. W. Chong, T. Isaacs, and J. McKinley, "Ecological systems theory and second language research," *Lang. Teach.*, vol. 56, no. 3, pp. 333–348, 2023, doi: 10.1017/S0261444822000283.
- [56] W. El Zaatari and I. Maalouf, "How the bronfenbrenner bio-ecological system theory explains the development of students' sense of belonging to school?," *SAGE Open*, vol. 12, no. 4, pp. 1–18, 2022, doi: 10.1177/21582440221134089.
- [57] T. Tanti, D. Deliza, and S. Hartina, "The effectiveness of using smartphones as mobile-mini labs in improving students' beliefs in physics," *JIPF (Jurnal Ilmu Pendidik. Fis.)*, vol. 9, no. 3, pp. 387–394, 2024, doi: 10.26737/jipf.v9i3.5185.
- [58] M. Furqon, "Family support and learning environment as key determinants of early childhood learning motivation," *IC-ESTEHE Int. Conf. Educ. Soc. Stud. Technol. Heal.*, vol. 1, no. 1, pp. 34–40, 2026, doi: 10.33650/ic-esteh.v1i1.14327.
- [59] J. K. Lastimoso and R. Galigao, "The role of teachers, classroom physical environment, peers and parents to learning motivation," *Pantao (International J. Humanit. Soc. Sci.)*, vol. 3, no. 4, pp. 346–357, 2024, doi: 10.69651/pijhs030435.
- [60] T. Tanti, A. Astalini, D. Darmaji, D. A. Kurniawan, and R. Fitriani, "Student perception review from gender: Electronic moduls of mathematical physics," *JPI (Jurnal Pendidik. Indones.)*, vol. 11, no. 1, pp. 125–132, 2022, doi: 10.23887/jpiundiksha.v11i1.35107.